Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Amending the Definition of Interconnected VoIP Service in Section 9.3 of the Commission's Rules	)	GN Docket No. 11-117
	)	PS Docket No. 07-114
Wireless E911 Location Accuracy Requirements	)	WC Docket No. 05-196
	)	
E911 Requirements for IP-Enabled Service Providers	)	

COMMENTS OF COMMLABS, INC.

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SUMMARY

The Commission concludes in its Notice of Proposed Rulemaking, Third Report and Order, and Second Further Notice of Proposed Rulemaking ("*Third Report and Order*" or "*Second FNPRM*") that the significant needs of public safety "requires development of indoor technical solutions and testing methodologies to verify the effectiveness of such solutions."[1]

In working to achieve this goal, the Commission should adopt rules that mandate the eventual implementation, testing and use of location capabilities that function successfully and reliably in indoor environments. Further, the Commission's rules should acknowledge that indoor location accuracy includes several important components.

First, most indoor settings are three dimensional, requiring both highly accurate horizontal and elevation location information in order to be of significant assistance. Second, indoor location information must be secured with a high yield on a consistent and reliable basis regardless of the type or density of the structure involved. Third, accurate indoor location information must be secured relatively quickly, necessitating that the time-to-first-fix ("TTFF") for indoor location technologies not be excessive.

Granted, significant challenges exist in satisfying these technical requirements and the Commission's location accuracy rules should acknowledge these challenges by employing gradual and flexible implementation requirements. The Commission should not, however, leave unresolved the question of whether indoor location accuracy and testing requirements will be adopted. As the Commission concludes, the important needs of the public safety community

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[1] Amending the Definition of Interconnected VoIP Service in Section 9.3 of the Commission's Rules, GN Docket No. 11-117, Wireless E911 Location Accuracy Requirements, PS Docket No. 07-114; E911 Requirements for IP-Enabled Service Providers, WC Docket No. 05-196, *Notice of Proposed Rulemaking, Third Report and Order, and Second Further Notice of Proposed Rulemaking*, FCC 11-107, ¶ 86 (July 13, 2011) ("*Third Report and Order*" or "*Second FNPRM*").

require accurate and reliable indoor location solutions. Further, the need for accurate indoor capabilities is increasing significantly each year.

Commlabs is working closely with the various stakeholders in the wireless industry and public safety community to facilitate the near term development, verification and deployment of an indoor location accuracy solution that satisfies each of the critical requirements. Commlabs is also testing its Wide Area Positioning System ("WAPS") in the San Francisco Bay Area with very encouraging results.

In addition, the Commission should encourage VoIP service providers to consider the use of wireless positioning technologies to provide highly accurate and reliably automatic location information ("ALI") for users of VoIP communications services. A wireless ALI solution could be employed on many types of VoIP equipment and could be very cost effective for the VoIP industry by allowing it to benefit from the substantial economies of scale that would result from using the same wireless ALI chips and services that are employed by major wireless carriers to create accurate location information for their customers.

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COMMENTS OF COMMLABS, INC.

Commlabs, Inc. ("Commlabs"), by its attorneys and in accordance with Section 1.415 of the Commission's rules, 47 C.F.R. §1.415, hereby submits its comments in response to the Notice of Proposed Rulemaking, Third Report and Order, and Second Further Notice of Proposed Rulemaking ("*Third Report and Order*" or "*Second FNPRM*") in the above-referenced proceeding.[2]

I. INTRODUCTION

Shortly before the deadline for comments in this proceeding, the Commission released a Notice of Proposed Rulemaking ("*NPRM*") that seeks to further the deployment of Next Generation 911 ("NG911") by enabling the public to send text, photos, and videos to emergency

[2] *See* Amending the Definition of Interconnected VoIP Service in Section 9.3 of the Commission's Rules, GN Docket No. 11-117, Wireless E911 Location Accuracy Requirements, PS Docket No. 07-114; E911 Requirements for IP-Enabled Service Providers, WC Docket No. 05-196, *Notice of Proposed Rulemaking, Third Report and Order, and Second Further Notice of Proposed Rulemaking*, FCC 11-107 (July 13, 2011) ("*Third Report and Order*" or "*Second FNPRM*").

personnel, rather than communicating with them solely through voice telephony.[3] The *NPRM* explores, *inter alia*, whether a near term text-to-911 capability should be made available to the public.[4]

Although these are admirable goals in their own right, they heighten the importance of ensuring that highly accurate and reliable automatic location information ("ALI") accompanies any texts, photos or videos that are sent to emergency dispatchers. Texting does not lend itself to extended exchanges regarding a texting party's location, particularly when the texting party can only describe landmarks or other visual geographic indicators.

Fortunately, the Commission has recognized the critical importance of developing more accurate and reliable location mechanisms for wireless communications. Last month, Chairman Genachowski released a five step action plan that begins by highlighting the need to provide ALI to first responders in order to enable them to find individuals in need of assistance "quickly and accurately."[5]

One of the major challenges in providing ALI to first responders is securing accurate, reliable and consistent location information for wireless callers in indoor environments. Multiple technological hurdles exist when indoor environments are involved, including signal attenuation and poor yield, a lengthy time-to-first-fix ("TTFF") when reception is possible, and the need to provide not just lateral location information, but precise elevation information as well.

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[3] *See* Facilitating the Deployment of Text-to-911 and Other Next Generation 911 Applications; Framework for Next Generation 911 Deployment, PS Docket Nos. 11-153 & 10-255, *Notice of Proposed Rulemaking*, ¶ 1 (rel. Sept. 22, 2011) ("*NPRM*").

[4] *See id.*, ¶¶ 36 – 47.

[5] *See Chairman Genachowski Announces Five-Step Action Plan to Improve the Deployment of Next Generation 9-1-1*, Speech to the 20111 APCO Conference (August 10, 2011), available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-309013A1.doc.

The Commission has tasked its re-chartered Communications Security, Reliability, and Interoperability Council ("CSRIC III") with studying the indoor location problem.[6] Although the plan of work for CSRIC III Working Group 3 (E9-1-1 Location Accuracy) addresses some of the issues identified above, the work plan makes no specific reference to the elevation or the TTFF issues.[7] In contrast, the Final Report for CSRIC II called for an "in-depth analysis of Z-height capability."[8]

Therefore, the Commission should emphasize to its newly formed CSRIC III the need for further study on the indoor location issue, with particular attention to the elevation, yield, and TTFF components of problem. The Commission should also consider whether to encourage progress on these issues further by moving forward with the adoption of rules mandating the eventual implementation of indoor location accuracy capabilities. Near term adoption of indoor location requirements would replicate the process that the Commission successfully employed in 1996 when it adopted its first wireless E911 location accuracy rules and thereby used its regulatory authority to encourage and "stimulate" the expeditious development and implementation of new location capabilities.

II. AS THE COMMISSION ACKNOWLEDGES, SOLUTIONS MUST BE DEVELOPED FOR INDOOR LOCATION ACCURACY AND TESTING

The Commission concludes in its *Second FNPRM* that "we consider indoor location accuracy to be a significant public safety concern that *requires* development of indoor technical

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[6] *See, e.g., Second FNPRM*, ¶ 88.

[7] The CSRIC III, Working Group 3 description of work to be completed is available at http://transition.fcc.gov/pshs/advisory/csric3/wg-descriptions_v1.pdf.

[8] Final Report of Working Group 4C, Technical Options for E9-1-1 Location Accuracy, Communications Security, Reliability, and Interoperability Council ("CSRIC"), at 28, dated March 14, 2011 ("*WG 4C Final Report*").

solutions and testing methodologies to verify the effectiveness of such solutions."[9] The Commission's conclusion is neither idly made nor should it be discounted as a "wish list" for future study. As detailed below in these comments, consumers increasingly use their wireless devices indoors, often to the exclusion of landline services, and the corresponding needs of the public safety community are real, current, and growing rapidly.

The Commission should now follow through with this conclusion and direct the CSRIC to do the same. Specifically, given the increasing number of emergency E911 calls that are made from indoor locations,[10] any location accuracy technology that does not function successfully in indoor environments cannot be deemed adequate as a public safety resource. From a public safety standpoint, indoor location accuracy can no longer be an afterthought or an exception to the rule. Based upon current and expected wireless usage trends, indoor location accuracy must become the rule itself.

Further, the Commission should acknowledge that indoor local accuracy is a three dimensional requirement. Although the inclusion of z-axis information is not usually needed in outdoor situations, it is a critical factor in many indoor emergencies, particularly in urban settings. Second, in developing indoor location accuracy and testing requirements, the Commission should require reliable and consistent yields, ensuring that indoor location capabilities function in nearly all indoor environments, regardless of the type and density of the structure involved. Third, the Commission should adopt thresholds regarding the maximum TTFF for wireless devices used in indoor conditions. Given the urgency of emergency response

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[9] *Second FNPRM*, ¶ 86 (*emphasis added*).

[10] *See id.*

conditions, a TTFF that is excessive would likely provide little utility to users of wireless devices and public safety first responders.

Granted, it may take time for the wireless industry to identify and implement technical solutions that address each of the requirements noted above. The Commission should accommodate this need by adopting gradual and, perhaps, flexible implementation periods for its indoor location accuracy and testing requirements, just as it did in 1996 for outdoor location accuracy.

The Commission should not, however, continue to leave ambiguous the question of whether indoor location accuracy and testing requirements will be adopted. As the Commission has acknowledged, the critical needs of the public safety community require that such capabilities be made available. The only question that should remain is the timing and the phasing for their implementation.

A. The Commission Should Adopt Indoor Location Accuracy Requirements to Address the Needs of Public Safety

The Final Report of the CSRIC clearly identifies the critical need for an indoor location accuracy solution to ensure the continued reliability of E911 emergency services.[11] As the Final Report explains

> As more and more of the population moves away from landline service and relies solely on mobile telephony devices, a larger percentage of E9-1-1 calls are being made via mobile telephony. This growth in wireless 9-1-1 calls has reached or is approaching 70% in many urban 9-1-1 Centers.[12]

The growth in wireless E911 calls identified in the CSRIC Final Report reflects a nationwide trend by consumers of using wireless devices indoors, often as a replacement for

[11] *See WG 4C Final Report*, at 59.

[12] *Id.*

landline services. According to J.D. Power's semi-annual wireless customer satisfaction survey, 56% of wireless calls are placed indoors and 35% from within the home.[13] Wireless communications has become an indoor service.

Concurrently, consumers are increasingly abandoning landline telephony to rely exclusively on wireless communications for voice and data services. According to the Centers for Disease Control, in the second half of 2010, 30% of households relied exclusively on wireless for telephony.[14] Furthermore, in those houses with a landline, 15% of households made predominately or exclusively wireless calls while the landline lay idle.[15] Perhaps not surprisingly, it is lower-income households that are most dependent upon wireless for their communications needs. According to the same CDC survey, more than 40% of households in poverty were wireless-only.[16] The Commission is therefore correct in concluding that consumers, particularly "at-risk" lower-income consumers, are increasing using their wireless devices indoors. A landline is becoming a luxury.

These statistics in and of themselves are suggestive of the value that is being delivered by location accuracy standards for E911. When the Commission's E911 location accuracy standards and test criteria were first implemented a decade ago, circuit-switched landlines were the dominant form of emergency communications. Cellular 911 calls were frequently if not exclusively placed from outdoor locations (such as from drivers on interstate highways) and in

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[13] *See Overall Wireless Call Quality Momentum Halts Due to Shifts in Wireless Call and Data Usage Patterns*, J.D. Power and Associates (March 3, 2011).

[14] *Wireless Substitution: Early Release of Estimates from the National Health Interview Survey, July – December 2010*, Centers for Disease Control.

[15] *See id.*

[16] *See id.*

many jurisdictions were routed through the State Highway Patrol PSAP infrastructure, where location accuracy data provided a supplement to highway mile markers.

A decade later, wireless is now predominately an indoor service and in many cases to the exclusion of landline telephony. It simply no longer makes sense to avoid indoor location accuracy and testing requirements for an indoor service. The Commission therefore must move forward with the development and adoption of rules that will lead to the implementation of location solutions that provide sufficient accuracy for indoor positioning.

Commlabs acknowledges that challenges exist with respect to the identification and adoption of highly accurate and reliable position location technologies for indoor environments. The existence of such challenges, however, does not alter the fact that indoor location accuracy standards must be implemented in order to maintain the efficacy of emergency response services during the migration of consumers from landline to wireless communications. At the very least, the Commission should acknowledge this necessity by adopting requirements for indoor location accuracy and providing an extended implementation period or tolling implementation until a predictable timeline can be established. Such an approach would be similar to the regulatory leadership that the Commission employed when it adopted its initial wireless E911 location accuracy requirements.

In this regard, it was almost exactly ten years ago, on October 1, 2001, when wireless carriers were first required by the Commission to provide location information for certain wireless E911 calls.[17] The Commission adopted these requirements in 1996 and imposed a five year implementation schedule that that the Commission acknowledged was "ambitious," but

[17] *See* 47 C.F.R. § 20.18; *see also* Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, *Fourth Memorandum Opinion and Order*, 15 FCC Rcd 17,442 (2000) ("*E911 Fourth Memorandum Opinion and Order*").

necessary to "stimulate" innovation.[18] As the Commission later explained, "[r]esearch, testing, and development requiring coordinated efforts by public safety organizations, wireless carriers, location technology vendors and equipment manufacturers were all necessary to produce technologies capable of pinpointing the location of wireless 911 callers."[19]

Granted, the rules that were adopted in 1996 by the Commission needed adjustments during their implementation. As the Commission explained, "[d]uring the course of this proceeding, we have revised our rules on occasion to reflect progress, and promote competition, in the development of wireless location technologies, as well as to facilitate compliance with the implementation schedule that we have established."[20]

Despite the occasional adjustment, the Commission's regulatory leadership was a success. As the Commission observed in 2000, "[t]he hard work and ingenuity of many people have produced a number of location solutions that are now commercially available, or are scheduled to be available soon."[21]

The Commission should employ this same approach to address indoor location accuracy. The Commission should adopt rules requiring the eventual implementation of indoor location accuracy and testing capabilities and also adopt gradual implementation deadlines, while making adjustments and extensions on an as-needed basis.

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[18] *Id.*, ¶ 7.

[19] *Id.*

[20] *Id.*, ¶ 8 (*citing* Revision of the Commission's Rules to Ensure Compatibility With Enhanced 911 Emergency Calling Systems, *Memorandum Opinion and Order*, 12 FCC Rcd 22665 (1997); Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, *Second Memorandum Opinion and Order*, 14 FCC Rcd 10954 (1999)).

[21] *Id.*, ¶ 3.

A number of companies, including Commlabs, are already working actively to perfect indoor location accuracy solutions. In partnership with its sister company, Progeny LMS, Commlabs is testing the capabilities of its Wide Area Positioning System ("WAPS") using a prototype WAPS network in the San Francisco Bay Area. This initial testing has provided extremely promising results with respect to indoor location determination. Commlabs is therefore proceeding forward with the deployment of its WAPS network and has begun site acquisition in major markets for its transmitter beacons.

Other companies are also working on the development of indoor position determination solutions either using new technologies, or through enhancements to existing technologies such as A-GPS and U-TDOA. The CSRIC Final Report discusses these efforts, but observes correctly that "a thorough validation of performance must be executed before adoption, assuming all other barriers to adoption are addressed properly."[22]

Commlabs strongly agrees that any indoor location accuracy solution, including its own, must be thoroughly and convincingly demonstrated to provide reliable and effective indoor performance before it can be considered for adoption and use by the public safety community and wireless carriers. To this end, Commlabs is actively meeting with the relevant stakeholders and is continuing to make available additional test and performance data on the capabilities of its WAPS service.[23]

The CSRIC Final Report also elaborates further on the apparent requirements for any new location accuracy technology that is developed, stating "[e]ven if the new technology proves

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[22] *Id.* at 72.

[23] *See id.* at 47 (noting that Commlab's technology is being demonstrated and tested by various partners for E911).

positive after this thorough validation, it must offer an advantage, and not just equivalence, over existing location methods in certain environments before actual deployment consideration."[24]

In some ways, the Final Report is stating the obvious – no reason exists to invest in a new position location technology unless it is truly better than the technologies that are in use today. Perhaps inadvertently, however, the Final Report also appears to express a judgment that existing location technologies are adequate, at least for the time being.

This impression is carried further by a comparison in the Final Report between existing location technologies and dynamic random access memory ("DRAM") semiconductors. The Final Report analogizes that in the semiconductor industry "there have been many new memory technologies that have been highly touted as the replacement for DRAM; yet, for 30 years now, none of them have proven to give enough of an advantage to displace DRAM in most computing architectures."[25]

Without venturing into a collateral discussion on semiconductors, Commlabs suggests that DRAM semiconductors are still in use today because they remain adequate for the task. In contrast, as the Final Report acknowledges, none of the location technologies in use today are sufficient for the future because they do not provide highly accurate and reliable, horizontal and vertical indoor location capabilities.

Although all analogies are inherently flawed, perhaps a better analogy would be the emergence of hybrid gas and electric vehicles. The government does not require the automobile industry to utilize specific technologies, it simply establishes the required fuel economy standards that must be met, and the industry uses the best combination of technologies to satisfy

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[24] *Id.* at 72.

[25] *Id.* at 71.

the required performance standards. Electric drive is not expected to replace completely internal combustion engines, as each has unique differentiating areas of strength, but the industry may choose to continue to combine these technologies as they desire to achieve the required performance.

The same hybrid approach may result with respect to E911 position location services. In general, emerging indoor location technologies are not optimized to replace GPS in unobstructed outdoor locations, but to be used in concert with GPS to achieved critical accuracy, yield and TTFF parameters in the urban environments where GPS was never designed to operate consistently. Further, none of the existing technologies provide z-axis capabilities. Thus, although today's technologies enable compliance with the Commission's rules as they exist today, they are insufficient to fulfill the growing indoor location needs of first responders and the public.

It may well be that the efforts to improve the accuracy and reliability of existing location solutions such as A-GPS that are discussed in the Final Report will prove successful.[26] Until such improvements are demonstrated to be effective and sufficient, however, the problem of indoor location accuracy will remain one that must be corrected. The Commission should therefore impress upon the newly formed CSRIC III that the status quo is untenable and further steps are necessary to ensure that first responders receive highly accurate, reliable and consistent position location information from all emergency callers, including those using wireless devices in indoor environments, irrespective of the technology that is employed to deliver that information.

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[26] *See id.* at 30-31.

Finally, the Final Report argues that the "emerging" location technologies that are under development should be considered "supplemental technologies to A-GPS and any currently deployed network location technologies for environments where the deployed technologies may not perform adequately, such as indoor settings."[27] To this end, Commlabs acknowledges that it has developed WAPS primarily to complement existing technologies such as GPS by providing highly accurate and reliable, horizontal and vertical, positioning capabilities in urban and indoor areas where existing technologies are lacking.

Commlabs therefore looks forward to continuing its efforts with CSRIC, public safety officials and the wireless industry in responding to the challenges of perfecting indoor positioning capabilities. Commlabs believes the Commission should continue to support these efforts by clearly stating that indoor location accuracy is a necessary component of its E911 requirements and compliance with indoor accuracy capabilities will be required of all service providers.

B. The Commission's Indoor Location Accuracy Requirements Should Include a Z-Axis Component

The CSRIC Final Report appears to acknowledge the importance of including a vertical-axis capability in any indoor position location technology that is developed, calling for a future study to conduct an "in-depth analysis of Z-height capability."[28] Aside from this brief reference, however, the Final Report surprisingly refrains from any significant discussion of the z-axis issue. For example, although Commlabs made a presentation to Working Group 4C on the z-axis

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[27] *Id.* at 72.

[28] *Id.* at 28.

capabilities of its WAPS technology, this discussion was omitted from that portion of the Final Report that provided a summary and assessment of Commlab's technology.[29]

The Commission also identified the importance of z-axis location information in its *First FNPRM*, observing that z-axis location information "could greatly enhance accuracy, and have particular benefit in buildings in terms of identifying the floor where the 911 caller is located."[30]

The Commission's *Second FNPRM*, however, does not address the issue, other than to acknowledge that the issue was raised in the *First FNPRM*.[31] Hopefully, the lack of attention to this issue in the *Second FNPRM* and the CSRIC Final Report does not signal a reduced focus on the problem by the Commission. As public safety officials explained in their responses to the *First FNPRM*, the inclusion of a z-axis location capability would be extremely helpful in many environments, such as indoor environments.[32] For this reason, the National Emergency Numbering Association ("NENA") argued that the delivery of vertical-axis position information should be "required for future-generation networks and devices, under uniform standards."[33]

Granted, significant technical issues must still be resolved, including ascertaining how PSAPs will be able to receive and process z-axis location information once it is made available. Commlabs believes it has developed a technology that is capable of providing highly accurate and reliable elevation information. Commlabs has also been exploring with public safety

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[29] *See id.* at 47.

[30] Wireless E911 Location Accuracy Requirements and E911 Requirements for IP-Enabled Service Providers, PS Docket No. 07-114, WC Docket No. 05-196, *Further Notice of Proposed Rulemaking and Notice of Inquiry*, 25 FCC Rcd 18957, ¶ 23 (2010) ("*First FNPRM*").

[31] *Second FNPRM*, ¶ 11.

[32] *See, e.g., Comments of APCO*, Docket Nos. 05-196 & 07-114, at 5 (filed Jan. 19, 2011).

[33] *Comments of NENA*, Docket Nos. 05-196 & 07-114, at 11 (filed Jan. 19, 2011).

officials on how to best present this information for use by PSAPs. Commlabs therefore looks forward to assisting Working Group 3 of the new CSRIC III in developing recommendations on these issues.

In any event, the existence of technical challenges should not deter the Commission in maintaining its role as a thought and regulatory leader in the development and implementation of E911 location solutions. Instead, the Commission should promptly indicate that Working Group 3 of CSRIC III should focus a portion of its attention on the z-axis issue. Such clarification appears necessary given the fact that the z-axis issue is not currently included on the description of work for CSRIC III Working Group 3.[34]

The Commission should also move forward with the adoption of a z-axis mandate in its indoor location accuracy and testing rules. It may be necessary to adopt gradual implementation periods for z-axis requirements, or to toll compliance deadlines until z-axis capable technologies has been validated and deployed. By moving forward promptly on these issues, however, the Commission will ensure that no ambiguity exists within the wireless industry and public safety community regarding the Commission's firm commitment to further the public interest by insisting on continued progress on these issues.

C. The Commission's Indoor Location Accuracy Requirements Should Mandate Relatively High and Consistent Yields and a Rapid Time to First Fix

In adopting indoor location accuracy requirements, the Commission should also mandate that positioning technologies be capable of relatively high yields in indoor environments on a reliable and consistent basis with a TTFF that is not excessive in most situations. As the Final Report acknowledges, A-GPS has a TTFF in "some dense urban or indoor environments" that

[34] *See supra* note 7.

can extend to greater than 30 seconds.[35] CSRIC explains in its Final Report that a TTFF of 30 seconds or more is "excessive" for use in E911 position location.[36]

As discussed in a prior section of these comments, efforts are being made to improve the indoor performance of A-GPS and to develop supplemental technologies that provide significantly better performance. For example, Commlabs is working with the public safety community and the wireless industry to demonstrate the yield and TTFF capabilities of its WAPS technology. As noted in the CSRIC Final Report, initial test data has shown that WAPS can provide a TTFF of three to five seconds following a cold start on at least 95 percent of attempts in most indoor environments.[37] Further testing is being conducted to verify these capabilities.

Meanwhile, in order to heighten the attention of the wireless industry to the yield and TTFF issues, the Commission should include in its rules a requirement that yield be consistent and adequate in indoor settings with a TTFF that is not excessive. The Commission should also ensure that Working Group 3 of CSRIC III focuses adequately on the indoor yield and TTFF issues. Although Working Group 3's statement of work addresses the issue of yield, it does not appear to address the TTFF issue.[38]

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[35] *WG 4C Final Report* at 30.

[36] *Id.* at 29.

[37] *See id.* at 47.

[38] *See supra* note 7.

D. The Commission Should Mandate Testing of Indoor Location Accuracy Capabilities

The Commission requests comment in its *Second FNPRM* on whether the Commission should require indoor location accuracy testing and, if so, using what standards.[39] This question is raised in the paragraph that is preceded immediately by the Commission's conclusion that indoor location accuracy is a "significant public safety concern that requires development of indoor technical solutions and testing methodologies to verify the effectiveness of such solutions."[40]

The question therefore does not appear to be whether the Commission should adopt such requirements, but what standards should be employed to satisfy the requirements that are adopted. To this end, Commlabs acknowledges the significant concerns raised by wireless carriers regarding difficulties that they have had attempting to conduct indoor testing, often on private property, in various locations in their service territories.[41]

Although Commlabs has conducted indoor testing of its WAPS technology only in the San Francisco Bay Area and not yet on a comprehensive basis, Commlabs can report a significant level of success with these efforts. Certainly, indoor testing cannot be ubiquitous or always in rigorous adherence to an uninterrupted grid format. Indoor testing will always entail more effort and expense than the "drive-by" validation of outdoor accuracy. Nevertheless, numerous public and semi-public structures exist within which testing can be arranged and conducted, providing a valid and representative test sample. For example, Commlabs recently conducted indoor testing over a wide area (256 square kilometers) in the San Francisco Bay Area,

[39] *See Second FNPRM*, ¶ 87.

[40] *Id.*, ¶ 86.

[41] *See id.*, ¶¶ 84-85.

including inside shopping malls, hotels, apartment complexes and fast food restaurants, all without unacceptable costs or complexity.

There are also well known companies in the industry that provide wireless network testing services, including indoor testing capabilities. These companies appear capable of making their own arrangements for building access and in using a combination of commercial surveying techniques and commercial tools such as GPS with inertial sensors to calibrate accurately indoor locations. Further, more than a decade ago, the Location Technology Forum of the CDMA Development Group published a set of guidelines and test scenarios for determining compliance with E911 requirements, and those guidelines and scenarios address indoor compliance and testing.[42] Other publicly available documents also require and characterize indoor performance testing. Therefore, although indoor testing does present challenges, in Commlabs' experience, these challenges are manageable.

III. VOIP DEVICES WOULD ALSO BENEFIT FROM WIRELESS LOCATION ACCURACY SOLUTIONS UNDER DEVELOPMENT AND THE COMMISSION SHOULD ENCOURAGE THEIR USE

The Commission requests comment in its *Second FNPRM* on the most cost effective solution for providing reasonably accurate location information for interconnected VoIP services, including outbound-only VoIP services.[43] In requesting comment on this issue, the Commission acknowledges that "commenters generally agree that at this time there is no technological or cost-effective means to provide ALI for interconnected VoIP service providers.[44]

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[42] *See CDG Test Plan Document for Location Determination Technologies Evaluation*, CDG Location Technology Forum (2000) (discussing, *inter alia*, various methods that are available to determine ground truth in indoor settings).

[43] *See Second FNPRM*, ¶ 73.

[44] *Id.*, ¶ 64.

Although cost effective and accurate ALI solutions for VoIP may not be in place today, their availability may be just over the horizon. Technologies are under development, including Commlab's WAPS technology, that could facilitate the provision of highly accurate location information for many types of VoIP devices, including interconnected VoIP and outbound-only interconnected VoIP. The Commission should hasten the development and adoption of such approaches by crafting regulations that set goals for the VoIP industry, mandating eventual compliance with threshold location capabilities, just as the Commission did more than a decade ago for wireless communications services.

Granted, the solution that Commlabs has under development would require the inclusion of a small GPS chip on VoIP handsets or terminals. Commlabs' technology also addresses only the creation of accurate ALI data for VoIP devices, and does not resolve the question of how this information should be conveyed to the appropriate PSAP.

VoIP service provides have generally resisted consideration of a wireless ALI approach, arguing that wireless location technologies are often less accurate than user-provided registered location data.[45] As the Commission acknowledges, however, user-dependent location solutions "have provided erroneous or fraudulent location information to PSAPs, leading to the waste of scarce emergency resources and squandering time that could have been spent responding to other emergencies."[46] The Commission therefore correctly concludes that "it is imperative to continue working towards an automatic location solution for interconnected VoIP calls to 911."[47]

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[45] *See Comments of Vonage Holdings Corp.*, Docket Nos. 05-196 & 07-114, at 6-10 (filed Jan. 19, 2011); *Reply Comments of Vonage Holdings Corp.*, Docket Nos. 05-196 & 07-114, at 5 (filed Feb. 18, 2011).

[46] *Second FNPRM*, ¶ 69.

[47] *Id.*, ¶ 70.

To address this critical need, other commenters have also advocated the use of wireless ALI technologies. For example, AT&T suggests the integration of ALI capabilities in the design of VoIP terminal adapters or user devices in order to employ wireless trilateration to accurately identify the location of VoIP users seeking emergency assistance.[48] AT&T suggests that significant technical and logistical challenges would first have to be addressed in order to implement a wireless ALI approach for VoIP.[49] Commlabs, however, believes that most of these issues can be overcome.

First, AT&T argues that, although the integration of a passive wireless receiver into most portable VoIP terminals may not be difficult, some devices, such as USB dongles and softphones (the latter of which often exist only in the form of software), generally could not accommodate the addition of a wireless receiver.[50] Certainly, a wireless ALI approach may not be appropriate for all forms of VoIP services, particularly "software only" implementations of VoIP. A wireless approach likely would be appropriate, however, for VoIP services that utilize a physical device or handset, which are arguably the types of VoIP services that consumers are most likely to expect to be capable of facilitating E911 emergency calls.

AT&T also argues that existing wireless location solutions such as A-GPS are often unreliable in indoor and urban environments, where VoIP devices are often used.[51] Therefore, the imposition of a wireless ALI solution on VoIP service providers using one of the existing technologies may not be worth the expense.

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[48] *See id.*, ¶ 67 (*citing Comments of AT&T*, Docket Nos. 05-196 & 07-114, at 19 (filed Jan. 19, 2011) ("*AT&T Comments*")).

[49] *See AT&T Comments* at 20.

[50] *See id.*

[51] *See id.* at 20.

Although shortcomings clearly exist with respect to existing wireless location technologies, Commlabs believes that technologies under development, including its own, can resolve these shortcomings, resulting in wireless location solutions that could significantly benefit users of VoIP services. These issues are discussed in prior sections of these comments.

Finally, AT&T expresses concern that employing a wireless ALI solution for VoIP equipment may be expensive.[52] In reality, however, a wireless ALI approach may be the least expensive solution for VoIP service providers because it would permit them to exploit the substantial economies of scale that can be realized by using the same receivers and software that would be used by the CMRS industry to provide ALI for their user devices.

Additional substantial cost savings could be realized if VoIP service providers employ the same ALI infrastructure as CMRS carriers. To this end, Commlabs is finalizing plans for the construction of its WAPS multilateration network, which will make ALI available for all types of mobile devices, including both CMRS and VoIP devices. The one-way architecture of Commlab's WAPS network enables the support of an unlimited number of mobile user terminals without any additional fixed or reoccurring cost to the network. Therefore, as the overall number of mobile devices utilizing the WAPS network increases, the cost for each unit decreases. In this manner, Commlabs will be able to provide its position location WAPS service to both the CMRS and VoIP industries at very low costs.

Although some may view the use of a wireless ALI solution for VoIP devices as an inelegant approach from a computer engineering standpoint, the fact is that wireless and computing technologies have long complemented each other and, in some situations, are merging. Many years ago, laptop computers began employing wireless modems to free themselves of

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[52] *See id.*

hardwired network connections. Meanwhile, cellular handsets have incorporated more and more computing technologies, producing the smart phones we use today. Laptops and netbook computing devices have shrunk again into tablets, which may soon become nearly indistinguishable from smart phones. In this hybrid wireless and computing landscape, a VoIP device that is viewed by the consumer as a voice communications device should include the expected ALI and E911 capabilities to the greatest extent possible from a technology and cost perspective.

The Commission should continue to take the lead in encouraging such technological innovations. Just as the Commission's original wireless E911 rules encouraged manufacturers of cellular equipment to include GPS chips in most handset, the Commission's adoption of regulations for VoIP location accuracy may encourage manufacturers in that industry segment to add additional capabilities to VoIP devices.

Given the development of new ALI technologies that can be employed by VoIP service providers and their customers, the Commission should move forward with the adoption of regulatory requirements for ALI accuracy and testing for VoIP devices immediately and either impose very gradual implementation requirements, or toll the enforcement of the new requirements until the new ALI technologies that are under development have been adequately tested, verified and deployed in major cities. In this manner, the Commission can avoid any confusion about the overall importance of implementing ALI solutions for VoIP services and making those capabilities available to public safety and consumers as rapidly as possible.

IV. CONCLUSION

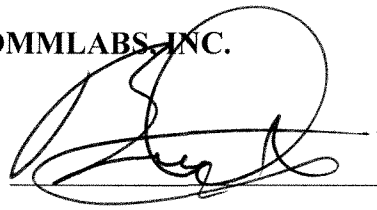
As the Commission has concluded, a critical need exists for accurate and reliable indoor location information to ensure the effectiveness of E911 emergency services for individuals

employing wireless devices. In mandating the development of indoor location accuracy solutions, the Commission should adopt rules that ensure that each major component of the indoor accuracy problem is addressed. Specifically, solutions must be developed and deployed that provide reliable and consistent indoor capabilities with a high yield, a low TTFF, and vertical-axis capabilities in order to respond adequately to the needs of public safety.

The Commission should also explore whether wireless ALI technologies could provide more reliable solutions for VoIP services that are currently dependent on highly unreliable user-provided location capabilities. The use of wireless ALI technologies on VoIP devices could provided substantial economies of scale and low costs by employing much of the same equipment and capabilities that are used by wireless carriers for their customers.

Respectfully submitted,

COMMLABS, INC.

By: 

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